methods and tooling aid both manufacturing and service personnel in performing evacuation, charging and testing operations.

The term "charging" as used herein includes the addition of a fluid into the system, whether the system is either completely empty of fluid or already contains fluid. The term "evacuation" as used herein includes the removal of portions of the fluid, or the entire amount of fluid, from the system. The term "testing" can include either charging or evacuation, as well as interactions with the system, such as pressure testing, whereby no fluid is added or removed. The term "processing" is meant to encompass charging, evacuation, testing and like interactions with the system.

Service Connection Valves

With reference to Figure 2, one embodiment of a service connection valve 10 is illustrated. This valve is similar to valves disclosed in US Patent 6,050,295 and U.S. Application Serial No. 09/975,911 (Atty. Docket No. 7371.42-US-U1), filed on October 11, 2001, now abandoned, which claims priority from U.S. Provisional Application No. 60/241,758, the disclosures of which are incorporated herein by reference.

The valve 10 is comprised of three primary components: a valve seat 12, a valve body 14, and a valve assembly 16. The valve seat 12 and valve body 14, which are formed from a metal such as brass, cooperate together to define a flow path through which a fluid, such as a refrigerant, is able is flow. The valve assembly 16 controls fluid flow through the valve 10. The valve body 14 and valve assembly 16 together form what will be referred to as a core 17 which can be removed from the seat 12.

The valve seat 12 is generally cylindrical and includes a first end region 20 that is illustrated as having a diameter that is reduced compared with the remainder of the valve seat. It is to be realized that the end region 20 could have a diameter that is about equal to, or greater than, the remainder of the valve seat 12, the diameter of the end region 20 being dependent upon the system to which the valve seat connects to. In the preferred use, the valve seat 12 is fixed to the refrigeration product in fluid communication with its closed loop cooling system by suitably securing the end region

central sleeve 56. The spacer 54 can either be removably or non-removably mounted in the passage 44.

A coil spring 58 surrounds the valve stem 50 and is engaged between the sleeve 56 and an enlarged end of the valve stem so as to bias the valve head 52 into sealed engagement with a seal 60, as well as with a lip 62 on the valve body 14 to provide a metal to metal seal as a back-up to the seal 60. Thus, flow through the valve 10 is prevented until the valve stem is biased, against the bias of the spring 58, to unseat the valve head.

With reference to Figure 3, a second embodiment of a service connection valve 100 is illustrated. The service connection valve 100 utilizes a one-piece valve body 102 rather than a separate valve seat and valve body as in Figure 2. Service connection valves using a one-piece body are disclosed in U.S. Patent 6,050,295 and U.S. Application Serial No. 09/975,911 (Atty. Docket No. 7371.42-US-U1), filed on October 11, 2001, now abandoned, which claims priority from U.S. Provisional Application No. 60/241,758, the disclosures of which are incorporated herein by reference.

The exterior construction of the one-piece body 102 is similar to exteriors of the valve seat 12 and valve body 14 of Figure 2. A valve assembly 104 is supported within the one-piece body 102 for controlling flow therethrough. The valve assembly 104 in this embodiment forms what will be referred to as a core 105, which can be removed from the body 102, with the body 102 forming what can be referred to as a valve seat for the core 105. The valve assembly 104 includes a valve stem 106, a valve head 108 and a spacer 110.

The arms of the spacer 110 are formed with threads, that are designed to engage with a threaded section 112 formed on the interior wall of the one-piece body 102 adjacent to a reduced diameter valve seat portion 116. The valve assembly 104, via the spacer 110 and the threads 112, can thus be inserted into and removed from the body 102.

The body 102 also includes a threaded section 118 and a circumferential detent groove or channel 120 defined between the threaded section 118 and a hex head